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AUTHOR Wedell-Monnig, Jacelyn; Westerman, Terry E.
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ABSTRACT

The feedback model of maternal language indicates that maternal language development is tailored to child feedback. The conversational model indicates that adjustment in mothers' speech occurs before the onset of child language. In order to verify the validity of these models, the language of mothers of six hearing and six deaf 13- to 29-month-olds was examined. The language of the mothers of the six deaf children was found to be very similar to, though generally simpler than, the language of the mothers of the hearing children. In addition, there were no changes in the language of the mothers of the deaf children over a two-month period, although the language of the mothers of the hearing children increased in complexity. A model of maternal language is proposed that incorporates aspects of the conversational and feedback models.
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Mothers' Language to Deaf and Hearing Infants¹

Jacelyn Wedell-Monnig and Terry B. Westerman

University of Texas at Dallas

Running head: Mothers' language

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First Author's address:

School of Human Development

University of Texas at Dallas

Richardson, Texas 75080

USA

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Abstract

The language of mothers to their 13 to 29 month old hearing or deaf children was examined. The language of the mothers of the six deaf children was found to be very similar to, though generally simpler than, the language of the mothers to their six hearing children. Also, there were no changes in the language of the mothers of the deaf children over a two month period, though, of course, the language of the mothers of the hearing children increased in complexity. A model of maternal language is proposed that incorporates aspects of the conversational and feedback models.

It has been well established that speech to young children learning language is different from speech to adults in several ways (c.f., Glanzer and Dodd 1975, Phillips 1973, Snow 1972). Speech to young children is simpler in vocabulary and syntax, consists of shorter utterances spoken at a slower rate, and is highly redundant. Also, utterances are well marked as complete units by pauses and intonations, they are for the most part declarative, imperative, and interrogative sentences, and the mother frequently repeats herself and expands on the child's utterances.

These differences appear toward the end of the first year and gradually drop out as the child grows older and begins mastering language. It has been generally assumed that feedback from the child is largely responsible for changing of the mother's code from "baby talk" to "adult talk." The feedback theory implies that as the child understands more and communicates this comprehension to the mother, she has less reason to use simple, short utterances, repetitions, etc. Glanzer and Dodd (1975) found that children respond selectively to mothers' speech and concluded that this provides the feedback necessary for the mother to tailor her speech to the child. Bohannon and Marquis (1977) examined the feedback model further and found that adults lower their utterance lengths following signals of noncomprehension on the part of the child.

Snow recently suggested that a simple feedback model of mothers' speech is inadequate. Rather, she proposes that mothers "operate on the basis of a conversational model in interacting with their babies" (Snow 1977: 20). The feedback model would predict abrupt changes in mothers' speech at the onset of child speech, or when the child was old enough for the mother to reasonably expect compliance to a request. Snow observed such changes much

earlier, when the children in her study were about seven months of age. Apparently by seven months, an infant's behavior can be interpreted by the mother as sufficiently reciprocal in nature to warrant a "conversation." The exchanges between mother and infant that Snow reports suggest that only a limited repertoire of infant behaviors can function as units within a conversation. Smiling, laughing, burping, vocalic or consonantal babbles, as well as looking at objects all qualified. Snow reports that arm- or leg-waving, bouncing, head movements, and crying were not responded to as if they were intentional and communicative. As the infants in Snow's study produced words, these were also, of course, responded to by the mother.

By studying only the language of mothers to their children who can hear, it is difficult to differentiate between the feedback and conversational models. Snow's (1977) observation that the adjustments in mothers' speech occur long before the infant begins to produce language is supportive of the conversational model, but does not rule out a feedback model entirely. By seven or eight months of age, infants begin to respond selectively to intonation, and these responses may guide the mothers' choice of language. This possibility was confirmed by Sherrod, Friedman, Crawley, Drake, and Devieux (1977) in a study of maternal language to prelinguistic infants. Sherrod et al. suggested that it is the infant's receptive ability that is the determinate of maternal speech, rather than only the child's level of language production. The authors observed that maternal speech to eight month old infants was less complex than that to four or six month old infants, supporting their thesis.

The two models can be compared, however, by examining the language of mothers to their infants who provide no direct feedback to the content of

speech - infants with severe to profound hearing losses. Such a group of mothers and infants were employed in the present study. The infants (13 to 29 months of age) were old enough to be providing linguistic feedback to their mothers -- if they could hear. None of the infants produced any oral expressive language; receptive language appeared to be limited to comprehending "no," "good girl," etc., though even these maternal utterances were usually accompanied by a shake of the head, a smile, or other visual cues.

The two models appear to have opposing predictions here. If the feedback model is appropriate, mothers should treat their children as very young hearing infants. Speech to very young prelinguistic infants does not have the modifications discussed earlier (Phillips 1973) and is characterized instead by high frequency and exaggerated intonation (Garcia 1974). On the other hand, if the conversational model adequately describes mothers' speech, similar types of conversational behavior should be seen between mothers of deaf infants and mothers of a matched group of hearing infants. We interpret the conversational model to include an assumption on the part of the mother that the child is capable of a conversational interaction, whether verbal or nonverbal, and that this assumption should be obvious in mothers' speech. That is, once the child has begun to respond in a consistent manner to mother's verbal and/or nonverbal communication (as early as seven or eight months of age), the mother will behave as if her child can participate in an interactive conversation.

Method

Six hearing-impaired children ranging in age from 1; 1.27 to 2; 5.6 at the onset of the study, all classified as severely to profoundly deaf,

participated in the study. The deaf infants were selected on the basis of availability and willingness of the mothers to participate. None of the mothers had any previous experiences with deafness. Of the six, three were first borns (subjects numbered 4, 5, and 6) and three were second borns (numbers 1, 2, and 3). There were five girls and one boy. Six hearing children, matched to the deaf group on the basis of age, sex, birth order, and socioeconomic status of both parents (education and occupational status) also participated.

Mother and infant pairs were brought individually into a laboratory playroom for a total of four 15-minute observation periods. The first two sessions were scheduled one to two days apart (Time 1). Six to eight weeks later, the second set of sessions (Time 2) took place.

The playroom (12' X 12') was colorfully decorated and fully carpeted with a chair for the mother and several current magazines on a small table. An upholstered bench (5' X 20"), large enough for the mother and child to sit on together, was placed along the opposite wall from the chair. Two throw rugs defined distinct areas in the room. One was placed in front of the chair and one in front of the bench. The third wall was covered with a mirror along its length; the opposite wall was fitted with one-way mirrors, through which the sessions were videotaped. Large posters of animals decorated the walls. The same five toys which were present during all sessions included a plastic ring stacker (Fisher-Price "Rock-A-Stack"), a Tupperware "Shape Sorter," a Fisher-Price "Play Family School Bus," a Fisher-Price "Jumping Jack," and a Playskool "Dapper Dan" doll.

The situation was relatively unstructured as demonstrated by the following directions given to each mother immediately preceding the observation:

"You are free to do whatever you wish. You might think of this session as fifteen minutes in your own home without any housework, any interruptions, or anything else to do. You're just free to be in the same room with _____ (child's name)."

Samples of the mother's speech were taken from only the second observation periods, after she and the child appeared to be more at ease and accustomed to the setting. After the first five minutes of the play session had elapsed, mother's first 100 utterances to her child, or all utterances occurring within ten minutes, whichever came first, were recorded. Therefore, for each mother and child, the data consisted of two, ten-minute samples, collected six to eight weeks apart (Time 1 and Time 2).

The language transcripts were recorded from the tapes by the second author and checked by the first author. Only those utterances on which both authors agreed were included in the sample. The language samples were scored from the typewritten transcripts and analyzed by ten different measures. Measures one through eight were adapted from Snow (1972) with only a few modifications. Measures nine and ten were included as possible sources of differences between these two groups of mothers. The measures are defined as follows:

1. Mean length of utterance (MLU): Ratio of total number of morphemes to the total number of utterances. (Rules for calculating MLU are listed in Table 1.)

Insert Table 1 about here

2. Sentence complexity: Ratio of number of compound verbs (two or more main verbs) plus subordinate clauses to the total number of utterances.
3. Mean preverb length (MPV): Ratio of total number of morphemes before the main verb in all clauses (a clause must have a subject and a verb) to the total number of clauses (imperatives were excluded).
4. Incidence of utterances without verbs: Ratio of number of utterances that did not contain verbs to the total number of utterances.
5. Incidence of third person pronouns: Ratio of total occurrences of third person pronouns: he, she, it, they, him, her, them, his, hers, its, their(s) to the total number of morphemes.
6. Incidence of complete repetitions: Ratio of number of complete repetitions to the total number of utterances (repetition must be within three utterances of the original).
7. Incidence of partial repetitions: Ratio of number of repetitions of one or more major units within an utterance to the total number of utterances (repetition must be within three utterances of the original).
8. Incidence of semantic repetitions: Ratio of number of repetitions of meaning of a previous utterance which did not include a repetition of any of its major grammatical units to the total number of utterances (a true paraphrase within three utterances of the original).
9. Incidence of utterances referring to absent objects: Ratio of number of absent objects referred to, to the total number of utterances.
10. Type of utterances: Ratio of number of declarative, interrogative, and imperative sentences to the total number of utterances. (Classification was based upon the intonation of mothers' voices as well as by the context in which they were spoken. Thus, an utterance may

structurally have been a declarative statement, but as judged by the context and intonation was recorded as an interrogative.)

Results

Tables 2 and 3 present individual data and group means for each of the ten measures. Two-way analyses of variance with repeated measures on one factor were performed on all measures. Data in the form of proportions were first transformed according to the arcsin transformation suggested by Winer (1971) in order to stabilize the variances. Two-tailed tests were used in all comparisons.

 Insert Tables 2 and 3 about here

The analyses revealed that the mothers of hearing infants used more complex language than mothers of deaf infants in terms of MLU ($F(1,10) = 9.22$, $p < .025$), sentence complexity ($F(1,10) = 14.45$, $p < .005$), as well as references to absent objects ($F(1,10) = 31.87$, $p < .001$). The effect of time was also significant for sentence complexity data ($F(1,10) = 11.15$, $p < .01$) with the hearing group apparently being primarily responsible for the effect, although the interaction effect was not significant. Mothers of deaf infants used more complete repetitions ($F(1,10) = 24.77$, $p < .001$). Although no overall differences in type of utterances were observed and the interaction was not significant, by time 2 the mothers of hearing infants were using significantly more interrogatives ($t(5) = 4.04$, $p < .01$).

When examining changes over time within the groups, more changes were evident in the hearing group, with MLU and sentence complexity reaching significance in the direction of increasing complexity with time ($t(5) = -2.89$, $p < .05$ and $t(5) = -5.40$, $p < .01$, respectively). MPL (mean preverb length) decreased over time in both groups, although the change was not significant.

Mean preverb length may not be a reasonable measure of complexity. No changes in the deaf group were significant.

The feedback model would predict that mothers of deaf infants would speak to their children as if they were young prelinguistic infants, since the children neither produced oral language nor were capable of comprehending oral language. This was not the case. Rather, mothers used a conversational mode of verbal interaction, with language level appropriate for younger, hearing children. To illustrate, the following interaction is typical of a mother and her deaf child. The child here is 23 months old, female. (Simultaneous events are listed on the same line; successive events on successive lines. Utterances are italicized.)

Mother	Child
Mother and child are sitting close together on floor	Child playing with Dapper Dan
Mother takes Dapper Dan from child	Child utters mild protest cry, looks at mother
<u>See the baby's shoe?</u> Points to doll's shoe	
<u>Wait, let's tie</u>	Child reaches for other toy
<u>Tie/tie/tie the baby's shoe/</u>	Child looks back toward mother
<u>tie the baby's shoe</u> Mother	Child looks at mother's face
slowly ties the doll's shoe	Child watches mother tie shoe

Are your shoes tied? Mother

points to child's shoe

Child looks at her shoe, holds
foot up to mother

Your shoes are tied/See?

Mother holds doll's shoe

next to child's shoe

Child begins to untie her shoe

Are you gonna untie them?

Child looks away, reaches for
new toy

In this situation, the mother both asks and answers her own questions, filling in for her child who cannot answer herself. We interpret this as supportive, in part, of a conversational model, in which the mother assumes the child is capable of a "conversational" type interaction, even if it is not verbal in nature. The model cannot, however, account for the less complex speech of the mothers of the deaf children. It appears necessary to invoke the feedback model to explain both the differences in complexity between the two groups, as well as the lack of change in speech characteristics over time among the mothers of the deaf children. Feedback in terms of noncomprehension signals from the children must be serving to keep mothers speaking in very simple and highly repetitive utterances.

In contrast, consider the following exchange. The child here is also female and 23 months old, but has no hearing impairment. Not only do the mother and child both participate in the verbal interaction, but the mother's

speech is more complex and less redundant than in the hearing mother-deaf infant exchange.

Mother
Mother sitting on floor;
watching child

That's - what is that?

That's a mommy that's right

A blue mommy/there's a green

little boy/see the green?

Uh huh

Okay, put it on your fingers

There/Oh my goodness

Big hand

Child
Child playing intently with
school bus and wooden
"occupants."
Child holds up wooden figure,
looks at mother. Is that?

Mommy. Looks down at schoolbus

Blue mommy

Points at figure. Is her
color blue?

Starts placing figures on
each of her fingers (like
finger puppets) Do it hand

Little boys on the hand. Places
final figure; now has a figure
on each finger. Whoa!

Big hand

Discussion

Both a conversational model, based on mothers' assumptions that their children can participate in a reciprocal "conversation," and feedback of comprehension or noncomprehension from the children appear to determine the characteristics of mothers' speech to their young children. The findings here that mothers of moderate-severe to profoundly deaf children not only speak to their children in utterances very similar to those of mothers of hearing children, but also interact in a similar manner, is the best evidence for the conversational model. However, the less complex speech of the mothers of the deaf children appears to be a function of feedback from their children. The continued feedback of noncomprehension serves to keep speech at a very simple level.

Why should the language of mothers of deaf children ever initially decline in complexity? Once these children (like hearing children) begin to respond with some consistency to nonverbal cues, mothers begin to expect the child to participate in a "conversation." The fact that deaf infants babble contributes to the development of "conversations." Many deaf infants also perceive some speech, perhaps only as muffled noise, and may respond to the sound, rather than to the content of speech. Nevertheless, a mother's vocalizations may stimulate her deaf infant to respond. In the early months of communication, mothers frequently accompany their utterances with numerous attention-getting and information-giving nonverbal behaviors, such as eyebrow raises, smiles, head nods, etc. Utterances are also simple, concrete, and center on the infant or the infant's activities (Snow 1977). The hearing child learns gradually to respond to the verbal cues alone and mothers are able to eliminate the nonverbal cues. Deaf infants continue to respond

primarily to the nonverbal cues, so mother does not eliminate them. Therefore, the language of mothers of deaf children initially decreases in complexity according to the same process that takes place between hearing mothers and their infants. However, the difference occurs when mothers of hearing infants begin to rely more on verbal communication alone. This difference was observable in the present data. Close examination of the videotapes revealed that mothers of deaf infants very frequently accompany their speech with descriptive gestures, regardless of their orientation toward modality of language teaching (oral only, oral-manual, etc.). It is our impression that if one is attempting to convey any amount of information gesturally (not through formal signs), it is difficult to speak at a complex level. That is, the need for gestures with deaf infants may serve, in itself, to keep maternal language at a simple level.

Increasing reliance on verbal communication alone among the mothers of the hearing infants revealed itself in the significant increases in several measures of complexity. The use of interrogatives also increased, suggesting that mothers are expecting their children to take increasingly more reciprocal roles in the interaction.

Bohannon and Marquis (1977) suggest that the only determining factor for the occurrence of Motherese is the presence of a listening child. Our data suggests that a watching child also provides feedback and elicits Motherese. Mothers, particularly of deaf children, may develop their conversational mode of language from feedback from nonverbal cues, as well as from verbal cues. For example, when mother speaks and points, the deaf child may respond to the point, in a manner perceived by the mother as intentional and interactive. However, the child's response of noncomprehension to complex

oral language, which cannot always be accompanied by sufficient gestural or other visual information, serves to keep maternal language at a simple level. Please note that we are not including formal signs in our definition of gestural communication. We assume that communication through formal signs will differ little from communication through oral language.

Indications that the use of formal signs may provide a linguistic environment similar to that enjoyed by hearing children came from observations of the only mother in our sample who used signs with any degree of consistency, though she was, by her own admission, "just learning." This mother (subject #5-deaf) had the highest MLU in the deaf group. The additional information she was able to give her son through signs and the feedback she received from her child's use (though minimal) of signs may have been the determinate of her advanced level of complexity. This mother was also the only mother of a deaf child who made any references to an absent object. She asked her son about the snow outside (a highly unusual event in Dallas) by using the sign for snow. She would have been unable to do so and expect any degree of comprehension through the use of oral language or oral language and informal, concrete gestures alone.

The lack of change in the language of mothers of the deaf children may be a point of concern, particularly among those mothers who choose to use only oral means of communication. Unless the child has sufficient residual hearing to develop adequate receptive language to comprehend more complex language than that seen in the present study, the interaction between the mother and child will remain at a very concrete level. The effects of such communication problems are discussed by Mindel and Vernon in their book, They grow in silence (1971). The authors note that limited communication

between the deaf child and his family lead to feelings of alienation from the child. In interactions with hearing children, these children will experience difficulties when game rules, even in games as simple as "playing house," are verbally transmitted. Mindel and Vernon express the concern that the deaf child who is limited to communication only at concrete levels is restricted to gathering information from primarily visual cues (other than formal signs); these cues are not sufficient in complex social situations. The child tends to "hang back" in an attempt to analyze a situation before entering into it. Mindel and Vernon attribute the "characterological rigidity" of some deaf adults to these early experiences. In addition, we feel that alienation is also a function of feelings experienced by the mother. When mother's expectations of a conversational interaction beyond a gestural level are not met, she feels frustrated and may be able to deal with these frustrations only by limiting further interaction with her child. To avoid such problems, we suggest that the hearing mother-deaf infant interaction be evaluated as one index of the child's progress in receptive and expressive language skills. "Conversations" that remain at a concrete level for an extended period of time may signal the need for other modalities of communication in addition to oral language and informal gestures.

In summary, we suggest a model of maternal language that incorporates aspects of both the feedback and the conversational models. The complexity of mothers' language initially declines and content of speech concerns the infant and concrete, observable events when the infant is seven to eight months of age and begins to respond consistently to verbal and nonverbal behaviors in a manner perceived by the mother as reciprocal. As the infant responds increasingly to verbal cues alone, mother eliminates nonverbal cues.

Feedback from the child of comprehension or noncomprehension serves to control the complexity of mother's speech, particularly when speech is not accompanied by other cues. When speech continues to be accompanied by visual cues, as in the case of a mother of a deaf infant, the use of these gestural or other visual cues tends, by itself, to keep speech at a very simple level.

Footnotes

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TABLE 1
RULES FOR CALCULATING MEAN LENGTH OF UTTERANCE
(Adapted from Brown, 1973)

1. Only fully transcribed utterances were used.
2. All exact utterance repetitions were included.
3. Fillers that were counted as one morpheme were as follows: OK, yeah, uh-oh, huh, uh-huh.
4. All compound words (2 or more free morphemes), proper names, and ritualized reduplications were counted as single morphemes.
(Jack-in-the-box, Dapper Dan, football, Thank you)
5. All inflections were counted as separate morphemes: possessive "s," plural "s," third person singular "s," regular past "d," and progressive "ing."
6. All irregular pasts were counted as one morpheme. (got, did, went, saw)
7. All diminutives were counted as one morpheme. (Mommie, doggie, horsie)
8. All auxiliaries were counted as separate morphemes: (is, have, will, can, must, would), although the following words were counted as only one morpheme: "gonna," "wanna," "hafta." Words that were counted as 2 morphemes included: can't, doesn't, that's, it's.
(These were words in which an apostrophe would have been present in written form, and thus two words were implied.)

TABLE 2
INDIVIDUAL DATA ON MEASURES OF MOTHERS' SPEECH

Matched Subject Pairs	Child's Sex	Session	Child's Age	Measure												Type of Utterance		
				#1	#2	#3	#4*	#5*	#6*	#7*	#8*	#9	#10*					
				MLU	SENT	MDL	VERB	P. D.	COMP	PAR	SIM	ARS	DECL	INV	IMP			
1-Hearing	F	I	1;11.8	2.00	.02	1.74	.33	.02	.13	.27	0	0	.61	.25	.24			
		II	1;11.3	3.39	.13	1.61	.35	.05	.00	.18	0	.01	.50	.19	.23			
1-Deaf	F	I	1;11.27	3.27	0	1.66	.15	.13	.14	.21	0	0	.80	.21	.21			
		II	1;11.10	3.67	.03	1.67	.16	.00	.10	.26	0	0	.51	.20	.22			
2-Hearing	F	I	1;10.12	3.17	.01	2.24	.17	.04	.05	.27	.01	.14	.54	.33	.11			
		II	1;09.9	3.71	.01	1.68	.14	.05	.05	.18	0	0	.56	.35	.09			
2-Deaf	F	I	1;10.21	2.82	.03	1.63	.14	.02	.32	.21	.01	0	.53	.16	.11			
		II	1;11.20	2.71	.01	1.30	.13	.02	.20	.19	0	0	.55	.23	.02			
3-Hearing	F	I	2;0.5	4.36	.03	2.19	.16	.01	.04	.16	0	.07	.63	.18	.13			
		II	2;1.23	4.73	.03	1.70	.22	.05	.03	.27	.01	.04	.49	.30	.21			
3-Deaf	F	I	2;1.9	2.73	.01	1.97	.00	.00	.15	.13	0	0	.71	.08	.15			
		II	2;3.30	2.72	0	1.85	.16	.05	.18	.15	0	0	.48	.23	.29			
4-Hearing	F	I	2;3.1	3.85	.04	2.00	.41	.07	.01	.20	0	.00	.49	.14	.10			
		II	2;7.25	6.00	.11	1.35	.33	.07	.06	.13	.01	.02	.41	.15	.22			
4-Deaf	F	I	2;1.24	2.24	0	2.43	.31	.01	.14	.18	0	0	.60	.17	.13			
		II	2;3.13	2.58	.04	1.45	.33	.09	.11	.25	0	0	.41	.27	.30			
5-Hearing	M	I	2;0.14	4.77	.06	2.36	.43	.03	.01	.19	.01	0	.62	.24	.15			
		II	2;4.14	4.72	.12	2.08	.30	.03	.04	.20	0	.02	.60	.39	.01			
5-Deaf	M	I	2;3.27	4.00	.01	2.00	.15	.06	.09	.36	.01	.01	.40	.31	.23			
		II	2;6.0	3.60	.04	1.54	.27	.06	.11	.17	0	0	.45	.22	.28			
6-Hearing	F	I	2;5.2	4.35	.00	1.71	.46	.03	.03	.27	0	.03	.60	.16	.25			
		II	2;5.2	4.00	.14	1.97	.24	.11	.10	.20	0	.02	.52	.20	.23			
6-Deaf	F	I	2;5.4	3.19	.04	1.81	.20	.06	.08	.30	0	0	.54	.18	.15			
		II	2;6.8	3.02	.07	1.41	.11	.16	.13	.17	0	0	.50	.09	.14			

* proportion of total utterances

Table 2
Group Means on Measures of Mothers' Speech

		Measure											
		#1	#2	#3	#4*	#5*	#6*	#7*	#8*	#9*	#10*		
			SENT		MO	3rd	COMP	PAR	SEM	ABS	Type of Utterance		
Group	Session	MLU	COMP	MPL	VERB	P.P.	PLP	REP	REP	OBJ	DECL	INT	IMP
Hearing	I	3.85	.04	2.04	.14	.05	.04	.22	0	.05	.57	.75	.18
Deaf	I	3.04	.01	1.89	.32	.06	.14	.24	0	0	.58	.22	.21
Hearing	II	4.09	.10	1.85	.31	.06	.05	.19	0	.05	.54	.30	.16
Deaf	II	3.03	.02	1.69	.31	.06	.14	.20	0	0	.50	.22	.25

* proportion of total utterances